

## GRAB Tutor Management System with SMS Notification

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### ABSTRACT

*Tutoring service is essential for students who require extra academic guidance in learning, especially at primary and secondary education levels. The common problems encountered by students are the difficulties in finding suitable tutors that meet their preferences. The existing web applications still lack responsive elements as they only provide a form to search for tutors. Therefore, the aim of this study is to address the inherent issue in finding suitable tutor matches among students and teachers by utilizing responsive filtering features and SMS notification technology. The inclusion of these features is crucial to ensure that both parties are informed of the appointment arrangement and status. The system known as GRAB Tutor Management System is proposed for secondary school students especially the SPM candidates. This study adapts and simplifies the System Development Life Cycle methodology into Three-Phase Model in designing and developing the system. The three phases are the analysis, development, and evaluation phase. Each phase carries specific activities to accomplish the aim of this study and successfully delivers the proposed solution. GRAB Tutor Management System has undergone a series of testing to evaluate its functionalities and acceptability. Functionality testing involved four expert and novice users, while user acceptance testing was conducted with 30 participants of secondary school teachers and students. The functionality test result reveals that all features are functioning well and satisfy the testing requirements. The user acceptance testing result indicates positive acceptance with an overall mean score of 4.64, which shows that the participants agreed that this system is acceptable, easy to use and useful. It is proven that this study has successfully delivered a web-based Grab Tutor Management System with SMS Notifications that is useful for tutors and students.*

**Keywords:** Filter, SMS Notification, Tutor Management, Web-Based System.

### INTRODUCTION

Traditionally, the process of finding tutors required a tedious process to ensure the satisfaction of students and tutors. Students will search for or get information from their friends, family members, a flyer sent by a local teaching center or institute or banners at the roadsides. Students have limited information about the availability of tutors within their housing areas, schedule, and the price they are charged for every session. However, in this new era, web-based technologies or tools can assist people to obtain such information as technological advancement has become more widespread. Managing tutoring services using web technology has eased the process of finding tutors for students. A study by

Ashraf, Ouf and Helmy (2020) emphasized that user satisfaction and focus attention are the key factors to provide impactful online service quality by providing personalized recommendations to customers. Besides, technology offers chances for job seekers, especially for fresh graduated. Salim, Mintarti, and Sudjatno (2019) and Hoe (2015) agreed that tutors can grab more job opportunities to advertise and publicize their skills and their currently available classes to the public more easily. With this kind of web technology, one can earn some money, and another person can obtain some specific knowledge (Tabassum, 2018).

Ideally, by having a tutor-student management system, the students can easily find suitable tutors based on their own choices. Students can easily choose their tutors based on the predetermined criteria and also save time and cost. According to Ram (2017), parents in Malaysia have spent approximately RM 110,000 on each of their children's education from primary to university level, which shows that parents are willing to pay for extra tuition tutoring fees for the benefit of their children (Abd Rahim, Rais, and Sugathan, 2020). Finding a tutor that is available requires extra effort (Safari, Abdullah, & Dahlan, 2018) especially in rural areas. Based on the preliminary investigation that has been conducted in this study, existing tutor finders web-based system mostly provide a basic searching function with some of them applying subscription fees for advance services/features or middle-man service charges for the tutors. In addition, the inclusion of responsive filtering features such as matching or searching criteria is still lacking, as only a list of the tutors is displayed and advertised.

In addition, the existing manual system based for finding tutors is a very time consuming and tiring process for the students (Natasha, 2020). Based on the current issues, parents need to deal with the tutor manually and this wastes time because they must go to the tuition center or personally contact the tuition center. In fact, tutor-student communication in setting the appointment date for the tutoring session might lead to misunderstanding or miscommunication without a proper automated notification service. In this case, the inclusion of the web-based for message notifications such as Short Message Service (SMS) or Instant Messaging (IM) technology can benefit users (Rendra, Nazori, & Ahmad, 2019). Applications such as SMS, WhatsApp, and Telegram allow users to send text messages in real-time to individuals or groups of friends free of charge and save time (Omomule, Adekile, Ajayi, & Orimoloye, 2020). One of the reasons behind the popularity of this service is its simplicity of use. The reminder notification service such as the information of booking time sessions can enhance the tutor management system. It is better for the system to keep the users informed, as well as the parents can take a note and be reminded of their children's improvements in their study. Information about the system status and notifications of system activity, allows users to understand the current context fully.

The following sections discuss related issues in literature reviews, the methodology of this study and the descriptions of results and findings.

## **LITERATURE REVIEW**

### **Private Tutor Management System**

In this era, the contribution of information technology (IT) in our daily life has grown rapidly and become essential to accomplish routine tasks or activities. In fact, IT makes our daily activities faster and easier to manage because all are now technology-oriented (Safari, Abdullah & Dahlan, 2018). Similarly, in private tutor management, IT enables communications as well as interactions between the students and tutors. Generally, private tutors are those who work with students to improve their skills in certain subjects. They provide primary and secondary school students and adults with one-on-one learning assistance. They also evaluate students' progress and discuss the results with students or parents. Private tutors also can help students in increasing their confidence level and improve students' achievement. According to Safari, Abdullah and Dahlan (2018), they use social media to promote and advertise their home tutoring to find students as the internet has grown rapidly.

Abd Rahim, Rais and Sugathan (2020) emphasized that private tutoring at home is very common nowadays, which is hardly surprising as it enhances not only the academic grades of students but also their realistic understanding of a wide range of subjects. Private tutor management systems offer both advantages and challenges for educators and learners. For example, the system offers more job opportunities for tutors. So, the tutors can advertise their skills using this web-based management system. With the wide range of tutors available, each with their strengths, specialities and learning styles, a tutor is expected to be well suited for each student (Owusu & Cobbold, 2020). Tutor management system in this study is expected to accommodate the related requirement and criteria of the tutor system such as the level of education, subject, and tutor experience, which that have been determined in preliminary investigation study. This is important to assist the students to filter a large amount of tutor service information (Al-Ghuribi & Noah, 2019).

A web application which is known as a web app is an application that is stored on a remote server and distributed through a web interface via the Internet (Shahzad, 2017). Web-based applications provide more consistency in the user interface from all multiple platforms as the design is more browser-dependent than an operating system. All web-based applications are composed of three main components: a web browser (or client), a web application server, and a database server. Web-based applications for databases rely on a database server that provides the application data. The inclusion of online and offline recommender services in the recommender server provides flexibility in filtering and recommending users' requests. More specifically, it should provide functionalities for both database and website management. Figure 1 depicts the web-based application architecture.

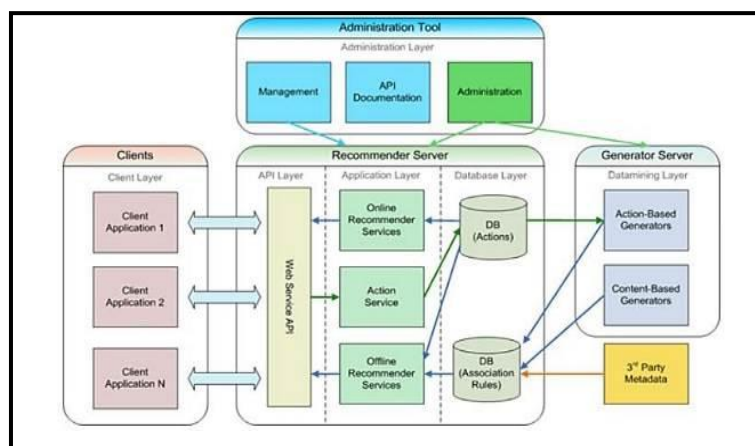


Figure 1: Web-Based Application Architecture (Source: Buzan, 2019)

## Notification Technology

Notifications such as text messages, e-mail, fax, and others help people communicate with one another in a quick, simple, and easy way. Short Message Service (SMS) technology is the most widely used type of text messaging. Since most people often use mobile phones, most companies use web-based systems that can be incorporated with SMS technology to make users who are familiar with SMS technology more convenient (Omomule et. al, 2020) and it is easier to reach the users (Nizam, 2017). It uses a structured communication protocol to exchange short text messages to a fixed line or mobile phone which is known as Simple Message Service Short Message Service Definition. SMS is currently supported on the major mobile network technologies including GSM (Global System for Mobile communications). Once a message is sent, a Short Message Service Centre (SMSC) will receive it and will then have to get it to the relevant mobile device as illustrated in Figure 2.

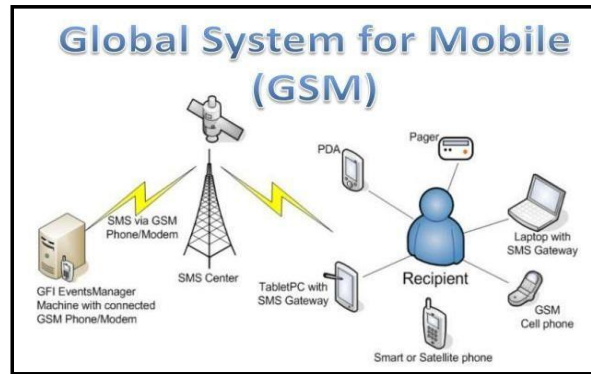


Figure 2: Global System for Mobile (GSM) (Source: White, 2019)

According to Naughton (2014), SMS allows senders to send and transmit short messages of 160 alphanumeric characters to any suitable receiving system running on the GSM network as a communication tool. Text messaging communication medium that uses SMS is a better option for teachers to communicate effectively (Adam, Mangka & Soh, 2019). Due to its applicability, it is a great way to receive emergency messages, for example, to inform the students about cancellations and rescheduling of class sessions. According to Nkpurukwe, Amangala, and Wali (2020), SMS marketing is a big part of making a mobile-friendly business and a strong asset for mobile marketing strategy. It is easier to promote products and services efficiently by sending text messages as most people are familiar with and have access to SMS technology. So, the main component of the notification service that will be implemented in this study is Short Message Service (SMS) technology.

### Functional Requirement Analysis of Related Studies

This section focuses on the functional requirements exploration and analysis of related studies. The extraction of functional requirements is based on four existing studies and their analysis by looking into the most applicable and suitable function for this study. Criteria for functional requirement extraction are particularly on common functions, filtering criteria and supported technology.

A+ Home Tuition Malaysia Homepage (2014) is a commercial tutor finder web-based system with a simple system design that supports multi-platform devices. This system is administered by administrators, and they help the parents to find a suitable tutor using a manual matching process. Even though the system provides easy navigational interaction for novice users, the system is lacking in terms of responsive features and flexibility, as parents are unable to approach the tutor based on their preferences. It only provides searching criteria to the list of registered tutors based on subject, location, tutor qualification and ranking.

Next, E-Education Portal for Students and Teachers (Hoe, 2015) is a lower entry barrier, multi-language support, easy matching of tutors with students and a web application with more functions than existing websites available in Malaysia. This web application also allows tutors to create more job opportunities by allowing them to post their available classes to the public and apply for the parents' tender. According to the research, this web application enables tutors to view and schedule their timetable for classes more easily. The system users include students, parents, or tutors, depending on the user's role when using this system. The systems are maintained by admin role users. An admin can perform an additional security function such as adding information details. This web application is implemented based on model-view-controller architecture and uses multiple technologies such as HTML, Java Servlet, JavaScript, CSS, JSP, JSF, JMS, JPA, AJAX, EJB and Flash.

Another study, Tutor Map (Tabassum, 2018), is an android app that is designed to help a student to find a tutor. This application also can help to prevent some problems in finding suitable tutors based

on location preferences. For this mobile application, a tutor does not have to pay the media so they can save their hard-earned money. This mobile application is using an Android Studio and is implemented using Java, KOTLIN and C++ as the main coding languages. For design purposes, the researcher has implemented the XML language to design the GUI for their mobile application. In addition, several systems are used as databases in an android database such as XAMPP, ORACLE, SQL-Lite or firebase (online database). For this mobile application, a firebase authentication system has been implemented. This system starts by requiring a user to register for a new account and sign in to this apps using a registered email and password. After signing in, it would automatically take the user to its defined page. If the user is a teacher, then it would take the user to the teacher home page or in another case, to the student home page. This android application also provides a searching method for users or tutors which allows them to search by the level of education, subject or by place.

The last study is a mobile application named, Tutor Finder (Thangamani, Sangeetha & Vijayapoornima, 2018). This mobile application established and developed a smartphone application for finding tutors for students. For this mobile application, the researchers implemented a location-based service that can help in getting the geographical location of the user. Information based on this location can be obtained in various terms such as location, vicinity, proximity, context, maps, places and so on. So, this project is focused on LBS in providing its services to users on the Android platform. In this tutor finding android application, students and teachers must register into the system. Based on the latitude and longitudinal mapping, the tutor location is mapped to the student. The system starts by searching their student's preferences such as subject expert and the system filters based on the location so that it will be easy for the finders to select a suitable tutor. Based on the students' selection, the tutors will be made available for their special classes and notifications will be generated to notify the students. This system provides an efficient searching method and gives effective and good results to users who use it.

Having discussed and analyzed the proposed solutions of those studies, the functional features, filtering criteria and supported technology are tabulated in Table 1.

**Table 1: Extraction of Functional Requirements**

Related Studies	Functional Features	Filtering Criteria	Supported Technology
A+ Home Tuition Malaysia Website (2014)	Request tutor, Find tutor, Apply tutor	Not Provided	Web-based Direct Message - WhatsApp
E-Education Portal for Student and Teachers (Hoe, 2015)	Manage forum, Manage homework, Search Tutor, Tutor ranking, Apply tutor	Based on tutor- ranking – good, average and bad	Web mobile friendly
Tutors Map: An Android App for Private Tutor (Tabassum, 2018)	Search tutor Search student Tutor registration Student registration Parent interaction	Education level, subjects and location- based	Mobile apps Location-based service
An Android Application for Tuition Finder (Thangamani, Sangeetha & Vijayapoornima, 2018)	Search tutor Student/tutor registration	Subject experts and location-based	Mobile apps Location-based service

Based on the extraction and analysis of the applications, it clearly shows that most of the studies offered tutor and student management and functionalities as compulsory features for instance student/tutor registration and tutor filtration (search). The inclusion of other additional features such as forum management, tutor-ranking and request, parent interaction and homework management could be indicated as considerable features. Having considered the importance of effective interaction feature between tutor and students (for example negotiating tutoring schedule, informing the scheduled tutor

session, messaging and notification services should be included as value-added functions in the proposed tutor management system.

## METHODOLOGY

This study focuses on proposing a tutor management system with the inclusion of a responsive filtering feature and SMS notification service. It has been conducted using Three-phase Development Model, which comprises analysis, development, and evaluation phases. Figure 3 illustrates the activities and deliverables for each phase.

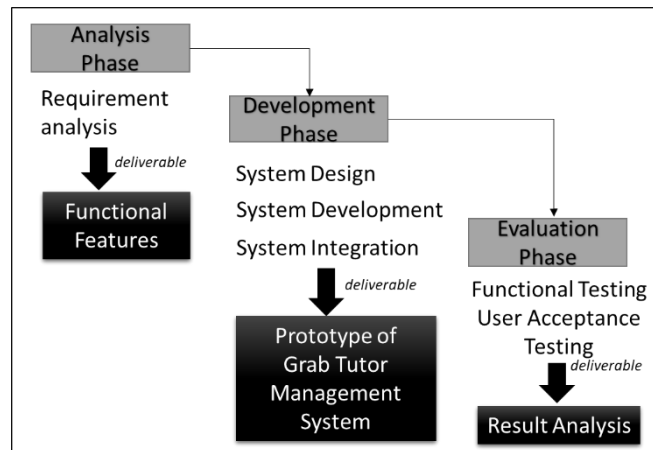


Figure 3: Three-Phase Development Model

In this study, the purpose of the first phase is to extract functional requirements by identifying related studies and analyzing the features. Those features are categorized as compulsory and additional features. In addition, this study also proposed the inclusion of value-added features. Having justified the functional features for the system, the development phase that consists of three main activities were executed. In this phase, designing the user interface, database and filtering algorithm were conducted before the system development took place. The development of the prototype known as Grab Tutor Management System (GTMS) was conducted using a web-based platform and integrated with SMS technology to activate the notification system as shown in Figure 4. It is designed with the inclusion of four main components as discussed in Section II, which are user interface, filtering criteria, notification services with service provider and database.

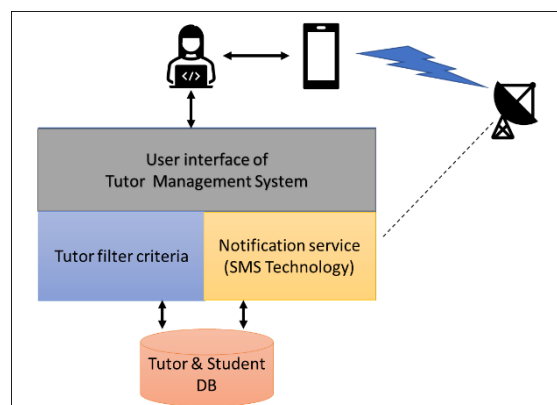


Figure 4: Grab Tutor Management System Architecture

Once completed, the prototype is ready for the evaluation phase. Extensive functional testing was conducted, in evaluating the applicability and functionality of all features and modules. The evaluation was conducted among three experts in web development and three novice users. Then, 30 participants engaged in User Acceptance Testing (UAT) using the Technology Acceptance Model (TAM) instrument to measure the acceptability of the system. The participants for UAT involved 10 tutors and 20 secondary school students (lower and upper secondary). The results have been analyzed and reported at the final stage of this study.

## GRAB Tutor Management System (GTMS) Prototype

The main page of GTMS consists of four main menus, which are “Home”, “Login”, “Become a Tutor” and “Become a Student”. The system begins with the signup process to activate the user account and then proceed to sign in as a registered user. Once the user has login the system, the main page is displayed where all the main menus in each user’s sections are provided. Figure 5 depicts the navigation structure of GTMS.

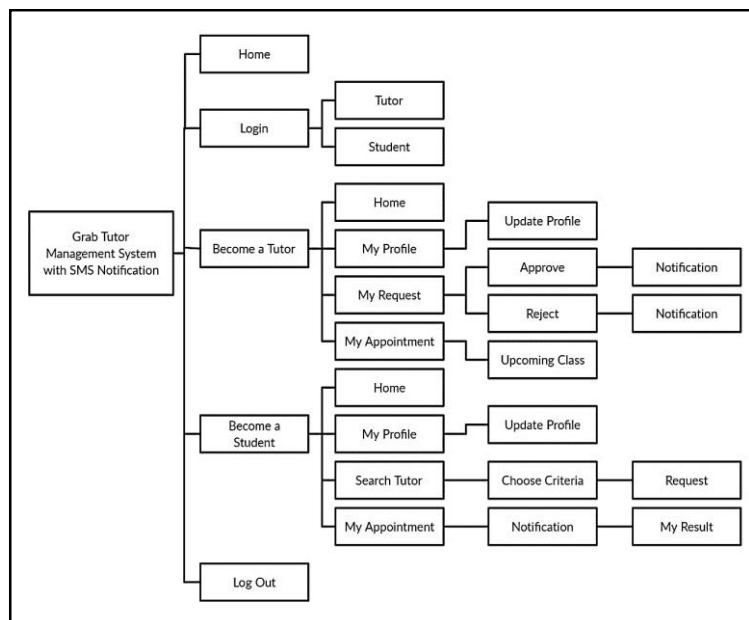


Figure 5: Navigation Structure of GTMS

The main feature in GTMS is to filter the tutor based on the criteria set by the user (student). Information filtering is concerned with the process of extracting information relevant to an individual’s preferences to provide tailored and relevant information only. GTMS is constructed based on the fixed user preference criteria as it offers three main criteria, which are ‘Experience Level’, ‘Gender’ and ‘Subject’. Figure 6 depicts the sample of interface design for the matching process. A user is required to set the criteria using a slider bar (experience level) and tick the checkbox for preferred gender and subjects. The result will be automatically displayed on the left-side panel with lists of tutor profiles. Detailed information of the tutor can be viewed by clicking on the tutor profile photo. Students can scroll and choose the most preferred tutor to set an appointment. The student is required to fill in the details such as the date, start time and the end time for appointment booking before requesting a tutor. Once requested, the tutor will be able to accept or reject the request based on his/her availability. Either rejected or accepted, the student will be notified, and the status will appear on the appointment request page. Later, the system sends an SMS notification to the student for every appointment that has been confirmed by the tutor. Figure 7 shows a sample of an SMS notification received by a student.



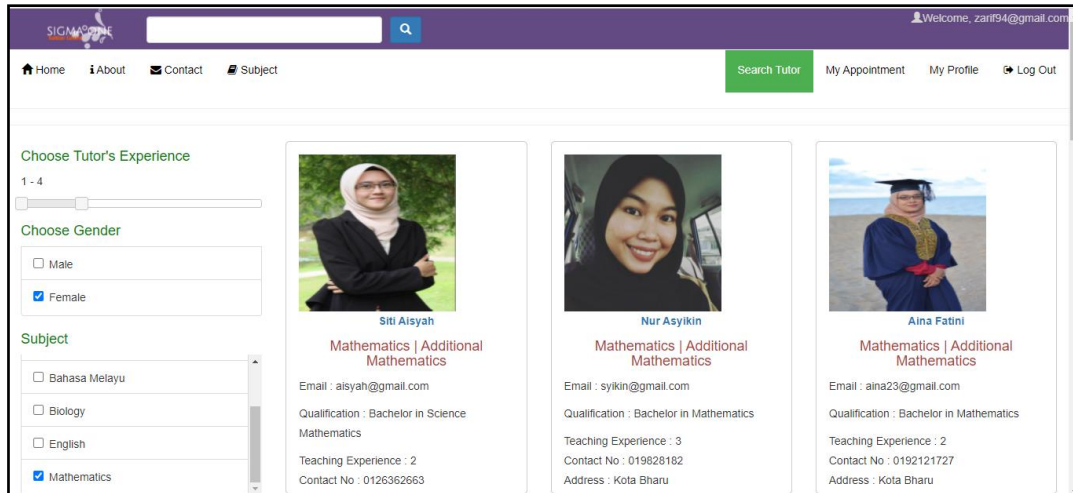


Figure 6: Matching Criteria with Sample Result

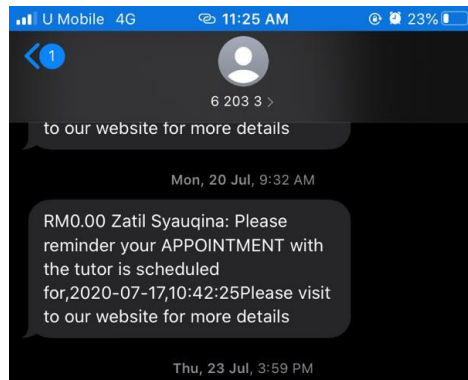


Figure 7: Sample of SMS Notification

## RESULT AND DISCUSSION

In this study, two types of evaluations have been conducted, which are functional testing and user acceptance testing. As discussed in the Methodology section, both evaluations were conducted to measure the functionality and acceptability of the system features. Accordingly, this section describes the testing procedures and result from the analysis of each testing result.

### Functionality Testing: Procedure and Findings

For the functionality testing, this study prepared a list of testing criteria known as a test case. It is divided into three main roles, which are admin, student, and tutor. Each role comprises specific functional features based on the system requirements. Figure 8 depicts the sample of test cases that had been distributed to the participants. They were given access to the system and responded to the given test case checklist. The test items included in the test case checklist were i) test steps, ii) test data, iii) expected result, iv) actual result, and v) test status. Table 1 lists the summary of test steps, test data and expected results for each role.



Project Name: Grab Tutor Management System (GTMS)	
Test Case	
Test Case ID: 01	Test Designed for: Dr Tajul Razak
Test Priority (Low/Medium/High): High	Test Designed date: 10 June 2020
Module Name: Admin	Test Executed by: 10 June 2020
Test Title: CRUD Function	Test Execution date: 10 June 2020
Description: Admin can create, view, update and delete the subject details (code, type, name).	
Pre-conditions: Admin CRUD	
Dependencies: None	

Figure 8: Sample of Test Case

Table 2: Summary of Test Cases

Role	Test step	Test data	Expected result
Admin	Input correct username and password	admin/ admin	Successful
	Input incorrect username and password	admin/ Admin	Failure – the system displays incorrect email or password
	Create subject details	admin/admin	Successful
	View subject details and all users	admin/admin	Successful
	Update subject details	admin/admin	Successful
	Delete subject	admin/admin	Successful
Tutor	Input correct username and password	zarif@gmail.com/zarif	Successful and system display to login.
	Input incorrect username and password	zarif@gmail.com/Zarif	Failure – the system displays incorrect email and password
	Update profile details (subject, teaching experience)	zarif@gmail.com/zarif Subject – Mathematics Teaching experience - 4	Successful update profile details
	View request appointment	annalieyna@gmail.com/ amalina87	Successful and system displays to accept or reject the appointment.
	Accept request appointment	annalieyna@gmail.com/ amalina87	Successful and system displays the booking details
Student	Input correct username and password	syarahhh1@gmail.com/ sya123	Successful and system displays a login page
	Input incorrect username and password	syarahhh1@gmail.com/ sya123	Failure – the system displays incorrect email and password
	Update profile details (Phone number)	syarahhh1@gmail.com/ sya123 phone number - 0121234567	Successful update profile details
	Set the criteria experience level, gender, and subject) and filter tutor	Experience level = 1- 4 Gender = Female Subject = Mathematics	Successful displayed the filtered criteria with 3 listed tutors.
	Choose the tutor based on criteria	izzati@gmail.com/ izzati14 Tutor – Siti Aisyah	Successful choose preferred tutor
	Request booking appointment	izzati@gmail.com/ izzati14 Date – 12 Jan 2021 Start Time – 12 pm End Time – 2 pm	Successful request for an appointment
	Receive SMS notification and view the booking appointment	izzati@gmail.com/ izzati14	Successfully received an SMS notification

Having conducted the testing sessions with 6 participants, this study found that all test steps for each role have successfully achieved the expected result. They were able to accomplish all test steps without any difficulties or system errors. The features for each user role, especially those related to user profile update, criteria setting and filtering, appointment request and acceptance/rejection, and SMS notification were successfully executed by the participants. It shows that the functionality of GTMS features is all intact and successfully implemented. The only comment from the expert participants is related to criteria parameters that should be varied and more flexible. This suggestion would be put under consideration for future enhancement to ensure that the filtering criteria are more comprehensive.

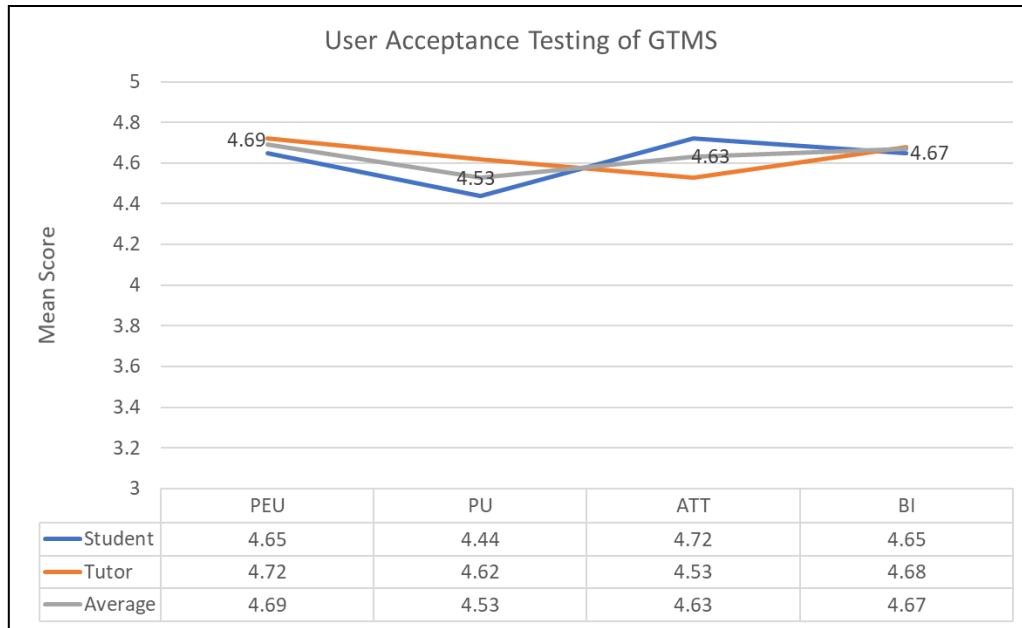
### User Acceptance Testing: Procedure and Result Analysis

User acceptance testing (UAT) is used to assess any system's functionality and ease of use (Ammenwerth, 2019; Davis, 1989). In this study, UAT was performed by the end-user to verify/accept the software system before moving the software application to the production environment. Hence, this study adopts the TAM instrument in evaluating the user acceptance in terms of Perceived Ease of Use (PEU), Perceive Usefulness (PU), Attitude Toward Using (ATT), and Behavioral Intention to Use (BI). Altogether, 30 participants were involved in this testing, 20 of them were students and the remaining were tutors. The participants were selected using random sampling that targeted only secondary students aged 15 – 17 years old and teachers from various teaching fields. Permission for the participants to involve in this testing session was obtained through their parents/schoolteacher, which is included as part of the instrument content. They registered as users to access the system and explored the available features based on their role, either as a tutor or student. Then, they filled in the TAM questionnaire using the google form platform. The instrument uses a 5-Likert scale as listed in Table 2.

**Table 3: Likert Scale**

Scale	Description
5	Strongly agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

The result of UAT is analyzed descriptively by calculating the mean score of 5 main categories in TAM. This study analyzed the mean score obtained from two roles of users, which are student and tutor. Figure 9 illustrates the comparison of two types of users with the average mean score.



**Figure 9: User Acceptance Testing Result Analysis**

The analysis of UAT results reveals the acceptance of GTMS by most participants as the mean score average of each dimension is greater than 4.5. With the mean score of 4.72 (tutor) and 4.65 (student) for PEU, GTMS is perceived as an easy to use and learnable system. It reflects that the flow, interaction, and functional features ease the users to accomplish the required process according to their roles. For example, criteria setting, tutor filter, and appointment request are among the clearest features in GTMS as reported by the participants. In general, the participants agreed that GTMS is easy to use with an average mean score of 4.69. Similarly, the participants also agreed that GTMS is useful for them especially for the tutors.

The mean score of PU as responded by the students is slightly lower ( $M=4.44$ ) compared to the tutors ( $M=4.62$ ). It is proven as the remaining 92% of participants (students) agreed that the feature is useful and enabled them to identify the most preferred tutor in a short time. Thus, it clearly shows that most of the students agreed that the system enabled them to search for their private tutor that matched the criteria and requirements that they needed. Only 8% of the student participants found the tutor screening process a bit confusing and time-consuming, which is probably due to their capability and experience in using a web-based system.

Apparently, based on the mean score for PEU and PU, it reflects the users' attitude (ATT) and behavior (BI) to accept GTMS to be utilized as a student-tutor management system. The average mean score results of both dimensions are 4.63 and 4.67, respectively. It explains that GTMS is preferable as one of the alternative platforms for students to find their preferred tutor, as well as the tutors, who can offer tuition service at their convenient time. The inclusion of an SMS notification service for appointment reminders also contributes to the acceptance of GTMS because users will be notified based on the schedules that have been set. Having analysed and justified the UAT result, this study found that GTMS is accepted, with an overall mean score of 4.64, as a useful online platform for the students and tutors in managing the tutoring services and enable the students to find the most preferable tutor based on the specific criteria.

## CONCLUSION

The research has involved the design and development of a web-based application system known as Grab Tutor Management System (GTMS) that is integrated with SMS notifications service. GTMS could assist students in finding suitable tutors in their nearby area (based on the tutor's profile) using a responsive filtering feature with minimal effort and time. The web-based on tutor management system could be very beneficial for students and tutors. This study aims to propose a solution to recommend the required tutor based on the predetermined criteria value set by the users. This system achieves its target to be a helpful tool for students and parents to overcome the problem occurred especially in scheduling their preferred tutoring session and getting notifications of the appointments that have been approved.

In this study, GTMS underwent two series of testing to evaluate its functionality and acceptability. By conducting these tests, this study aims to obtain the result and feedback on the loopholes of the system from end-users and make some improvements to any flaws of the project so that the project can be accepted by the users and succeed. Based on the result of functionality, GTMS is successfully delivered as an alternative solution in finding suitable tutors based on the criteria and requirements provided by the users. This system managed to filter and match the preferred tutors and enable the students to proceed with the appointment request and setting up the tutoring schedule. Similarly, the tutor and admin features also have been delivered successfully following the system requirements. GTMS acceptability is evaluated using Technology Acceptance Model (TAM) evaluation instrument with 30 participants who revealed their acceptance, as well as agreed that GTMS is useful and easy to use. Based on the feedback, it clearly shows that the integration of automated SMS notification in GTMS has been well accepted by the users as it eases the communication between students and tutors.

However, this system only focuses on managing the tutor and student information as well as the tutoring session appointment and approval. In future, GTMS should consider the inclusion of a payment feature to handle cashless tutoring fees. In addition, the system will be more convenient and efficient with the application of a location-based system to automatically track the location of the students. As an example, incorporating the GPS Location Tracking that can automatically track the location of students and match with the tutor's location. This feature can make the system more flexible to enable students to meet their criteria and requirements when finding suitable tutors based on their current location.

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